Strengthening of traditional paddy seed selection practices of tribal farm families with improved knowledge and skills in Koraput district, Odisha

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Received 29.11.10, revised 06.04.11

Koraput is known to be a centre of origin and diversity of Asian cultivated rice (Oryza sativa L.) and recently recognized as one of the agro-biodiversity hot spots in India. Tribal and rural farm families in Koraput raise food crops using local seeds and have a repository of traditional seed selection practices. While farmers have valuable traditional knowledge, there is a lack of support mechanisms and relevant training to enhance their skills in the seed selection process. This paper examines the impact of training on the knowledge and skill of farmers with a specific focus on seed selection practices and its management. The study brings out the significance of capacity building of farm families through Training of Trainers (TOT) programme. The impact of training reveals enhanced knowledge, skill and decision making among farmers with regard to seed selection. Pure and quality seeds helped to improve agricultural productivity and ensured household food security. Purified seeds of landraces cultivated in different land categories fetched 30-50 % higher prices. Designation of such farmers as Primary Trainers provides them recognition and a distinct identity in their community and their services made use by the KKRGC and Village Knowledge Centre (VKC). To make the practice sustainable, there is a need for supportive Government policies to maintain and develop traditional seeds in situ and on farm.

Keywords: Agro ecology, Rice, Landraces, Seed selection, Tribes, Traditional knowledge, Training, Koraput, Odisha

IPC Int. Cl.9: A01, A01C, A01G 9/00, A01G 16/00, A01C 1/00, A23B 9/00

The Koraput district of Odisha, India is recognized for its rich diversity in Asian cultivated rice (Oryza sativa L.) and established as one of the centers of origin of Asian cultivated rice. The ancestors of present day tribal communities residing there have domesticated rice in that region and are responsible for its conservation and cultivation on farm. Tribal communities of Koraput district belong to the Proto Australoid ethnic stock speaking Austro Asiatic language and have maintained their rich biological and cultural diversity1. These communities are distinct in their culture, tradition and customary rules that have been sustained due to their remote location. Inadequate formal education, lack of exposure and distinct language barriers keep them largely insulated from the outside world. Many of these tribal farming communities are at a stage of food scarcity and poverty due to an increasing population, shrinking land holdings, reducing forest cover and unpredictable rainfall. Since 1961, their population has increased by 93 % reducing the per capita availability of cultivated land2. Moreover, the introduction of modern High Yielding Variety (HYV) crops has narrowed the genetic base of various traditional crops including rice and indiscriminate use of chemical fertilizer reduced soil fertility.

Agriculture is their primary livelihood and rice the major crop, occupying 59.4 % of the total cultivable area and 75 % of this land which is rain-fed. Most (70 %) of the small and marginal landholders have an average operational holding of 0.59 ha and average yield of 15.33 quintal / ha (Census of India 2001). Compared to the coastal areas of Odisha, crop productivity in Koraput is low. In 2008-09, 70 % of the farming community was cultivating landraces of rice in merely 12 % of the agricultural lands demonstrating the genetic erosion of rice.

Rice is grown chiefly in the kharif season, generally following the dry and wet broadcasting method. Transplanting occupies a very small
proportion of the total cultivable area. Their impoverished condition and the low level of education impede effective utilization of modern rice production technology.

**Tribal farm families**

The ancestors of the present tribal communities have domesticated rice in the region for thousands of years contributing to conservation of rice landraces suited to different agro ecological conditions – upland, medium land and lowland – and upholding promising traits like nutritional and cooking quality, aroma and resistance to several biotic and abiotic stresses. In addition, they preserve specific rice landraces to be used in their religious functions, social ceremonies and life cycle rituals celebrated throughout the year. Wide ranging duration and staggered harvesting from different land categories fulfills their consumption needs over a period of time as well as their economic needs in the annual agricultural cycle. However, a majority of these landraces are poor yielders\(^3\). Use of poor quality seed, planting in unprepared soil using high seed rate, lack of resources to monitor crop growth and inadequate knowledge of advance agricultural techniques are reasons in recent times for poor yield\(^4\).

**Traditional paddy seed selection practices**

Traditional seed selection practice plays a crucial role in providing pure and quality seeds to resource poor tribal and rural farming communities. It enables farming communities to maintain and develop the purity and quality of traditional varieties, along with the associated traditional knowledge, and also helps to transfer practices from one generation to another. Traditional seed selection practices are an integral part of the informal seeds system, which support sustainable production in marginal agricultural production systems\(^5\).

In many countries of the world, traditional varieties are generally maintained through informal social seed networks, while improved varieties are managed through the formal seed sector. In developing countries, the informal seed system plays a central role in the provision of planting materials: in India 80-85 % seeds are supplied by the informal sector\(^6\); in Nepal 90-95 % of the overall seed requirement is fulfilled by the informal system\(^7\) and more than 97 % of the seed of the main staple, rice, was purchased from the informal sector in 1999-2000\(^8\). In Sub-Saharan Africa approximately 66-85 % of seed used by resource poor farmers is derived from informal markets\(^9\). In Ethiopia 80-90 % of the national seed requirement is covered by the informal seed sector\(^10\).

Seed selection is an important aspect of seed production. Selection is done to:

- (i) improve seed vigour by selecting well developed plants and plump seeds (physiological and analytical quality), reduce disease incidence by discarding obviously diseased plants or seeds (sanitary quality),
- (ii) maintain the genetic quality of the variety (varietal identity), and
- (iii) continually adapt the variety to changing growing conditions and obtain better varieties\(^11\).

**Deterioration of seed selection practice of paddy landraces**

During early 1970s, Government extension agencies started distributing certified seeds of High Yielding Varieties (HYVs) along with fertilizer and pesticides at a subsidized rate with a buy-back arrangement, to increase production and productivity in the tribal villages of Odisha including Koraput. They also conducted field training programmes for HYV seed multiplication. This encouraged tribal farm families to go for HYV cultivation to obtain subsidized inputs and achieve a higher yield. At that time farmers were neither having access to scientific seed storage structures nor were provided with additional cultivable lands. Temporary discontinuation in cultivation (3-4 yrs) had led to the loss of traditional seeds as well as practice\(^12,13\).

At present certified seeds are made available by Government agencies in the Community Development Blocks of the tribal areas, which can be bought before the onset of agricultural season. Over the years, with the changing and unpredictable weather conditions, yield of rice landraces has reduced the area under traditional rainfed agriculture. Sometimes erratic and uneven rainfall does not allow timely selection and separation of seeds, compelling farmers to go for bulk harvesting thereby diluting the seed quality.

Men start migrating to other places for non-farm work avenues immediately after the peak agricultural season to meet their economic and food needs, as they do not get adequate yields from their lands. Further, tribal farm families cannot afford to engage paid
labourers for separate seed selection and processing. Acute poverty sometimes forces them to consume the seeds during periods of food scarcity. In that condition farmers borrow seeds from other farmers, buy seeds from the local market or prefer to go for HYV for the next sowing. Once farmers lose the seeds of landraces, it is difficult in their part to retrieve them. Eventually landraces and consequently the genetic resources of rice start to go out of cultivation, affecting conservation.

State efforts in the seed sector and extension

The Odisha Agriculture Policy, 1996, accords priority to multiplication of HYV seeds to replace traditional varieties/landraces. To encourage farm families, an incentive on production of certified seeds and a subsidy on the distribution of certified seeds were provided. Seeds released in the last 10 yrs have been given priority. HYV seed multiplication has been organized through Odisha departmental agricultural farms, Odisha State Seeds Corporation, Seed Village Programme, Special Seed Village Programme and private registered seed growers. Under Special Seed Village Programme, initiated in 2006 by the Government of India, farm families are specifically oriented for certified seed production with a 50% subsidy. In Koraput district 1200 farm families from 24 villages were trained twice on quality seed production between 2006 and 2009 in 0.5 acre of own land. In 2009, the Government sold 46,722 q of seeds to farm families at a subsidized rate. Despite implementation of the organized seed programme since the early 1970s, the seed replacement rate has only reached the level of 15-20%. The rest of the seeds used in cultivation were saved by the farm families, which accounts for nearly 80-85% of the total seeds used. Previous reports show that of a hundred million farms in India, only 15 to 20 million farms use seeds from the regular seed trade, while the remaining 80 million farms depend on seed supply through the informal sector.

Government agencies have been distributing seeds of three to four HYVs for the upland regions, of which only one (Khandagiri) is popular among the tribal farmers. Similarly seeds of three to five HYVs have been distributed for medium lands, of which only one (MTU 1001) is accepted by tribal farmers. In contrast, 12 HYV seeds suitable for lowland are being distributed of which the farmers’ preference goes to two varieties (Puja and MTU7029). Thus, in spite of the infrastructure and networking available, Government agencies are unable to fulfill the seed requirement of farm families. Except a few progressive and rich farmers, mostly farming communities depend on their own farm saved seeds. There was a growing realization of the need to strengthen the use of technology in seed selection, multiplication and dissemination in subsistence tribal agriculture to ensure pure and quality seeds and on farm conservation of rice genetic resources.

Methodology

The study involved a survey component and a Training Component. A “training needs assessment” was conducted to determine the existing need of farm families and to prioritize their needs in a systematic manner to fill the gap between regular and real practice. In addition data and information generated out of the needs assessment would also work as a benchmark for evaluation of training and help increase motivation among primary trainers.

Surveys

A survey was conducted in nine tribal working villages of Koraput in 2006, to identify seed source of rice landraces cultivated in the villages. A follow-up survey was conducted in 2007 to collect data on the existing traditional seed network in the tribal villages and options for seed purification and production. In the same year a semi-structured, pre-training assessment questionnaire was drawn up and data collected from 31 Primary Trainers residing in three project villages on various components of traditional cultivation practices, with special emphasis on seed and water management for the three land categories. In 2008 a post-training assessment survey was conducted and data collected from the 31 primary trainers.

Location and Background

Three heterogeneous tribal dominated villages viz., Nuaguda, Gunthaguda and Boliguda were selected to carry out the training programme (Fig. 1). Tribal communities residing in the villages belonged to Bhumia, Paroja, Gadaba and Bhatra. They live in extended nuclear families with an average family size of four members. Agriculture is the mainstay of their economy, followed by wage earning and gathering from forests. The average landholding was 2.5 acres with a maximum holding of 18 acres. Rice is the chief
crop, followed by ragi (*Elusine coracana*), horse gram (*Dolichos biflorus*) and cowpea (*Vigna sinensis*) in the *kharif* season and green gram (*Vigna radiata*) in the *rabi* season. Almost one fourth of the households were landless.

Farmers were following traditional cultivation practices for all crops grown in the project villages. In their opinion, low literacy and poverty have hindered the adoption of scientific methods of cultivation. Yield from their small and marginal holdings was poor, leading to food scarcity. The average food scarcity period ranged from 2.7 months to 5 months a year. Approximately one fourth of the men migrated in search of work to different places during the non-agricultural seasons.

Nearly two decades ago, HYV was introduced in these villages through Agriculture Extension Officers, who suggested that yield would increase with the use of improved seeds and chemical fertilizers with hope of better yield, farm families started shifting from landraces to HYVs losing valuable genetic diversity of their landraces. In reality resource-poor farm families were not able to achieve higher productivity from HYVs. Moreover, they were not satisfied with the taste and the nutritional quality of the HYVs.

In 1998 the M S Swaminathan Research Foundation (MSSRF) initiated a project in partnership mode with farm families for assisting impoverished farmers in tribal villages of Koraput that extended for a decade aimed to restore and revitalize rice genetic diversity through its conservation and sustainable use while maintaining gender equity and equitable benefit sharing. Blending of traditional knowledge with scientific inputs was the basic concept for enhanced knowledge and skill improvement of farm families.

MSSRF initiated training on seed selection with one of the aromatic landrace, *Kalajeera*, by highlighting the importance of selecting the mother panicle and other healthy panicles and successive steps of seed purification (threshing by leg; hand winnowing; cleaning by picking undersized, off colour seeds; and sun-drying) and storage with biopesticides. After eight years of work on *Kalajeera*, the Kalinga Kalajeera Rice Growers’ Cooperative Society was formed and registered for quality seed production of that particular landrace. The same strategy was extended to primary trainers who would select the panicles of the mother tiller and healthy primary tillers of their preferred landraces growing in different micro-ecological conditions and would extend their knowledge and skill to fellow farm families.

**Training design**

Training was designed on the Training of Trainers (ToT) Programme mode, which is an accepted way of facilitating location-specific technology development and dissemination through knowledge and skill improvement in rural and tribal areas. The project aimed to enhance the knowledge of tribal and rural farm families to acquire scientific information and implement these in their practices and further in disseminating this information and knowledge. MSSRF therefore planned the ToT with a view to increasing the outreach of the training programme to several villages. The programme aimed to:

(i) sensitize farm families on the need and importance of pure and quality seeds who would act as primary trainers

(ii) help participants become aware of the scientific process and method of seed and panicle selection,
(iii) help participants build their competencies (knowledge, skills and attitudes) required to identify select, train and assist potential farm families to select and manage seeds.

Training methodology
A total of 13 men and 18 women trainees were selected randomly from the three project villages and were designated as primary trainers. Initially, each primary trainer taught a minimum of three to four farm families who in turn taught nine to sixteen farm families in the following season and so on. The acquired knowledge was disseminated to fellow farm families who then began training other farm families. In this process direct and indirect beneficiaries were formed.

Six training sessions were held during 2006 April and 2008 April before and during the cropping season through personal interactions with instructive video films, indoor and outdoor demonstrations to explain the scientific logic behind the need for selection of pure and quality seeds.

Post training field visits were made to assess learning and knowledge transmission and impact of the training on individual farm families made through personal communication.

It was decided that all primary trainers would act as resource persons for the Village Knowledge Centre (VKC), established in one of the project villages for demand-led and location-specific knowledge dissemination using ICT tools. Audiovisuals would be created for the VKC on scientific cultivation practices of landraces with specific seed-selection methods. It was also decided that the primary trainers would be trained at significant stages, if necessary, and taken for exposure visits. They would be provided with timely and appropriate advice as per requirement and need expressed by the trainers.

A simple illustrated training manual in the local language, on scientific cultivation practices, with special emphasis on seed selection was published for further reference for the primary trainers and subsequent trainees.¹⁴

Results and discussion
In tribal villages, small and marginal farm families select and save seeds from their own crops and are satisfied with the seed quality. If needed, they prefer to exchange seeds before sowing or after harvest with friends and relatives of the same or neighbouring villages. They believe this practice is the most reliable method of sourcing seeds. On special occasions they provide and receive rice seeds having essential qualities as gifts from friends and relatives.

The survey conducted in nine tribal villages of Koraput in 2006, revealed that nearly 41.29 % of the traditional seeds were stored by families, 14 % were obtained through exchange among matrilineal and partilineal families, clans and other farmers, 39.68 % were revitalized through Village Seed Banks and 5.5 % were obtained through gifts and borrowing on special occasions like festivals, marriages and social ceremonies. The local seed management practices among farm families makes possible the accessibility of seeds, but the intensity of the process has been on the wane after introduction of HYVs.

The follow-up survey was conducted in eight villages, and 58 men and 64 women attended these discussions in their respective villages. Focused Group Discussions (FGD) were organized to collect data on the existing traditional seed network and options for seed purification and production. The following information was gathered for the three land categories.

Follow up survey findings
Upland
In uplands, 86 % of the seeds used were traditional seeds. Farm families most often used farm saved seeds and rarely bought it from outside. In case of need, their first choice was to exchange seeds within the village. Only 23.44 % of the farm families bought seeds in case of shortage such as seed loss during a bad season or consumption during food shortage and inability to save sufficient seed. Nearly 31 % farm families said they bought seeds for new varieties. As a part of their culture, they exchanged or replaced a particular variety every two to three years primarily to discard weeds.

Ninety per cent of the farm families were satisfied with the quality of their own seeds. However, 83 % found seed-borne diseases in their crop. Most (82 %) of farm families grew upland rice primarily for food. Sometimes it was bartered for other necessities, but rarely for cash.

Medium land
In medium lands, 45 % of the seeds used were traditional farm saved seeds. Here, 20 % of the farm families chose to purchase seeds sometimes or often during seed shortage. Frequently, farmers purchased seeds of new varieties with preferred characteristics.
assisting easy weed eradication from the rice field. Of the farm families, 59% expressed satisfaction with their own seed quality. However, 88% of the farm families had seed diseases in the crop occasionally or often. Half of the farm families grew it chiefly for food and half for both food and cash.

Lowlands

In lowlands, traditional seeds were used for cultivation among 59% of farm families; 57% sometimes or often purchased seeds to replace old varieties with new varieties carrying desirable characteristics. Replacement helped in easy weeding. Most (93%) of the farm families were satisfied with the quality of their seeds although 92% of the crop got infected with seed diseases. Since the yield was high, 80% of the farm families grew this for both food and cash.

From the study it was concluded that since in all the land categories more than 80% of farm families reported crop with seed diseases, seed quality should be given priority for crop improvement. Since all the three land categories contributed to the food and economic need of the farm families, a common practice of seed selection before sowing and mother-and-healthy-panicle selection from the standing crop was finally decided for all.

Seed selection methods

Tribal farm families select rice seeds at two different stages i.e., before sowing and before harvesting. There are customary rituals associated with the selection although the actual practice varies between tribes and also families. Pure and quality seeds are selected from standing crop before harvesting both from mother panicles and other healthy panicles to get a uniform crop stand and healthy plants resulting in increased yield.

Traditional seed selection procedure before sowing

Seed selection is associated with tribal customs and rituals performed at home. Seed selection procedure differs between the upland, medium lands and lowlands. In upland and medium lands, tribal women take the seeds in new bamboo baskets to a nearby pond and sink three-fourths of the basket in the water while holding the basket tightly. Then they stir continuously by hand to allow weed seeds, chaff, straw and small undersized light weight grains to float atop. On discarding the floating waste, they hand over the seeds to men for sowing. This selection process results in a comparatively higher germination percentage and fewer weeds in the field.

In lowlands, before sowing, men take three handfuls of seed from each landrace. At an auspicious time fixed by the Disari (the village priest cum traditional healer), they take the seeds to the field in a new bamboo basket, placing a dia (lamp) over the basket. They sow all the seeds in one corner of the field in different patches. Between the 3rd and the 8th day, they verify the survival rate of the landraces sown. They then remove the seedlings from the field and undertake bulk sowing of desired seeds with 80% survival rate.

Panicle selection procedure before/after harvesting

Selection of healthy panicles from the standing crop demands a lot of time and labour and takes place depending upon the availability of these two. Three methods are normally followed;

(i) from the standing crop in the field prior to harvest
(ii) in the threshing yard prior to threshing and
(iii) from the threshed paddy in the threshing yard.

Generally, (i) the entire family get involved, as the procedure is both time and labour-intensive procedure. While selecting panicles from the field they give importance to visible physical characters such as; disease free healthy plants and well-filled heavy panicles with bright-coloured husk. Plants are selected either from a good patch or randomly from the whole field. They follow this process to purify a desired landrace or for seed production for local trading.

(ii) Before threshing, women pick healthy panicles from the harvested crops and thresh them separately by stamping by foot instead of threshing by bullock to keep the seed (embryo) intact. Occasionally young girls help their mothers in this process by winnowing and physically picking out under-sized and off-colour grains, sticks, sand and small stones to clean the seeds and get rid of impurities. After winnowing, the seeds are sun-dried on cow dung smeared floor for 2-3 days and stored for further use in the next sowing season.

(iii) At present majority of the farm families regularly follow the last method of seed selection to save their time and labour. They separate out the required amount of grain to save as seed from the
total threshed harvest. Bulk sieving is done to separate out mainly the seeds of wild rice and weeds. Rest of the procedure is similar with the other two methods.

Mostly medium and large farm families grow rice plants in separate plots exclusively to produce seeds and use it themselves later for sowing as well for local trading. They take extra care of the plot by applying manure, discarding off-types, keeping the plot free of weeds and protecting the crop against pests and diseases.

Till date the tribal culture is integral to the selection and preservation of healthy plants for panicle selection. As a part of tribal culture tribal communities celebrate Bandapana Parab in the month of August in which women select few healthy plants in the field. They tie hand-woven threads dipped in turmeric water to selected plants along with a palm leaf written with mantras or annotations. The village priest (disari) gives each family the thread and the palm leaf. Women also give rice cakes, payasam, jaggery and banana as offerings to the Goddess to ensure tillering vigour and a bumper crop harvest.

Primary trainers

All the primary trainers were original inhabitants of the region and 68 % of them belonged to Scheduled Tribes (ST). Almost two-thirds (71 %) were within the active farming age of 25-45 yrs. All were married except one young farmer, and five were widows living with their children. Agriculture was their primary occupation and rice the major subsistence food. Most of them come under small and marginal farmers’ groups, having two to three acres of operational landholding. Most have a minimal formal education of primary school.

Many farmers were of the opinions that the landraces yield was poor due to lack of modern knowledge and resources. Despite which individual farmers have preserved one to maximum five; most of them have two to three rice landraces. They expressed their desire to learn scientific methods to improve their skills in quality seed selection and production.

Pre-training assessment based on land category

A semi-structured questionnaire was drawn up and data collected from 31 Primary Trainers residing in three project villages on various components of traditional cultivation practices, with special emphasis on seed and water management for the three land categories. It was clear from the data that the practice of seed selection and healthy panicle selection, which is a key component for increased yield and sustainable agriculture, had disappeared or waned over the years. For short-duration rice, 62 % of Primary Trainers selected seeds from the threshed rice after processing. Other Primary Trainers used grain as seed after simply cleaning the threshed paddy. For medium-duration paddy, 4.76 % of the Primary Trainers undertook mother tiller selection and 48 % selected seeds from the threshed paddy. For long-duration rice, 62 % of the Primary Trainers went for healthy panicle selection, 29 % separated seeds from the threshed paddy in the threshing yard and 9 % did not select seeds at all.

Post-Training assessment on knowledge skill and behavioral changes

The primary trainers were empowered with improved skill and scientific knowledge. The transformation of traditional agricultural practices into knowledge-based agricultural practices empowers farm families, improving production and household food security. Increased agricultural productivity raises the standards of living for tribal and rural small-scale farm families. It also helps to conserve genetic diversity on farm and its sustainable utilization for the betterment of life (Table 1).

Training of Trainers (ToT) Programme has benefitted sharing and extending knowledge and skill between farm families. Post training, field visits and personal interviews showed that most (93.54 %) primary trainers opted for seed selection before sowing for 12 landraces with different maturity periods, and also sowed, cleaned and healthy seeds in the fields, resulting in a uniform crop stand with lesser weeds and wild rice. The seed rate reduced by

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<th>Criteria</th>
<th>Pre-training</th>
<th>Post-training</th>
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<tr>
<td>Knowledge</td>
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<tr>
<td>Seed selection before sowing</td>
<td>1</td>
<td>4</td>
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<tr>
<td>Seed rate/acre</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Weed management</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Mother tiller selection</td>
<td>1</td>
<td>5</td>
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<tr>
<td>Confidence in sharing and</td>
<td>2</td>
<td>5</td>
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<td>knowledge extension</td>
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<td>Skill</td>
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<td>Seed selection before sowing</td>
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<tr>
<td>Mother tiller selection</td>
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<td>Time needed for practice</td>
<td>1</td>
<td>4</td>
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<tr>
<td>Qualitative changes</td>
<td>1</td>
<td>4</td>
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Poor-1, Fair- 2, Good- 3, Very Good- 4, Excellent- 5
30–50 % as farmers used quality seeds, and farmers saved sowing-time. Two farm families did not follow seed selection, as they replaced their landraces, but they shared their knowledge, as did other primary trainers, with fellow farm families residing in their villages through demonstration. It also revealed that skill improvement in seed selection before sowing enabled tribal women to save up to 20 - 30 % of their weeding time and labour, depending on the land category (Table 2).

Out of the 31 primary trainers, 26 (83.87 %) selected mother and healthy panicles from the standing crop for 10 landraces of rice having different maturity dates, and raised under diverse ecologies. The trainers, and trainees with the help of their family members, selected panicles from the standing crop in case the quantity was lower. If the quantity was better, labours were hired. Seven trainers hired labours for panicle selection. Other trainers worked in pairs: husband and wife, mother and daughter, daughters-in-law and mothers-in-law. For short-duration rice, the panicles were smaller in size compared to the medium and long-duration rice. Approximately 4 kg seeds were collected per day by a trainer from the uplands compared to 15 kg per day from the medium and low lands. The average number of seeds per mother tiller and other healthy primary tillers were 70 in short-duration landraces, in contrast to 150 and 170 in the case of medium and long-duration landraces.

Scientific knowledge of seed selection and purification helps farmers in grading the seed by quality and fixing the price for different grades. Since the uplands are fragmented, with marginal growing conditions and imperfect market linkage, the area

<table>
<thead>
<tr>
<th>Land category</th>
<th>Purified landraces (No. of Farm Families)</th>
<th>Desired Traits from Farmers’ viewpoint</th>
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<tbody>
<tr>
<td>Upland</td>
<td><em>Para Dhan</em> (3) Grows in unbunded uplands, suppresses weed growth, provides food during scarcity, red rice, suitable for rice flakes, used in Nuakhia (new crop eating ceremony), own consumption as well as bartered locally and a popular variety.</td>
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<td><em>Pandkagura</em> (2) Suitable for multiple cropping, hence a very popular variety. Coarse rice, gives the feeling of a full stomach, suitable for all parched rice specifically rice flakes, good milling quality, good for fodder, own consumption.</td>
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<td><em>Sapuri</em> (8) Non-lodging, straw used for thatching. Slender grain, white kernel, mildly aromatic, good for making <em>Payasam</em> and <em>Pala</em> (traditional sweet delicacies), and all parched rice, best for popped rice used during marriage ceremonies. Yields nearly 16q/acre. Good threshing and milling quality. Own consumption and marketing. Good market price.</td>
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<td><em>Muktabali</em> (1) Non-lodging. Disease and pest resistant. Small oval but heavy grains, white mildly aromatic rice, used to make <em>Payasam</em> during marriages. Good for fodder. Own consumption.</td>
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<tr>
<td>Lowland</td>
<td><em>Kalajeera</em> (7) Highly aromatic, small, oval and white rice, good for <em>Pulao</em> and <em>Payasam</em>. Good threshing and milling quality. Higher yield and good market price. Own consumption and selling. Straw is good for thatching and fodder.</td>
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<td><em>Sunaseri</em> (2) Non-lodging, disease and pest resistant. Medium grains with red husk and white rice, sweet taste, stay longer in stomach. Suitable to make parched rice. Good threshing and milling quality. Own consumption.</td>
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<td><em>Umuriachudi</em> (2) Strong culms hence tolerant to lodging. Long, heavy and dense panicles. Coarse but white rice. Grains do not shed during harvesting, yields more. Good milling quality. Suitable for making all parched rice, most suitable for rice flakes. Tribal people prefer to consume it during <em>Chaita Parba</em> (post harvest merry making) in March/April as it stays for a long time in the stomach. Most popular rice. Own consumption.</td>
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under rice is less, as is also the seed requirement. Upland rice is meant for the farmer’s own consumption, as it matures during the food scarce period. Farm families do not opt for seed commercialization, as there is less demand for purified seeds. Since yield is low compared to medium land and lowland, it does not fetch a good market price. The price of pure seeds harvested is 30-50% more than that of impure seeds (Table 3).

Primary trainers shared their knowledge among friends and relatives. At the end of the second year, the primary trainers had trained 52 farm families. Slowly, other farm families gained confidence and started selecting their seeds from the mother tiller and healthy side tillers for sowing in the following year. At the end of the third year, farm families realized that pure seeds give healthy plants, which are able to withstand drought and flash flood conditions for a longer period and give high and sustainable yields. It also protects the crop from diseases and pests. Now farmers have the confidence to produce pure and quality seeds for sowing and selling.

At the end of first year six primary trainers selected 34 kg of pure seeds from three short duration paddy, thirteen primary trainers produced 380 kg of purified seeds from five medium duration paddy and 260 kg of pure seeds were selected from three long duration paddy by eleven primary trainers. A total of 674 kg paddy seeds were purified in a year.

Extension of knowledge among friends and relatives gives Primary Trainers recognition in society. When they visit friends and relatives with purified seeds they get a distinct position and high appreciation. Working as primary trainers through the VKC programme earns them social prestige and engages them to promote the transfer of the improved management practices and technology.

**Conclusion**

From the study it was clear that in Koraput district of Odisha, tribal farm families grow rice landraces to fulfill their economic, social and cultural needs besides food and nutrition, yield stability and other desired traits like tolerance to physiological and ecological stress and resistance to pest and diseases. In contrast to the formal seed sector, the traditional seeds network plays a major role in maintaining the *in-situ* on-farm diversity and sustainability but call for quality improvement to be remunerative.

Government agencies and agriculture extension departments are unable to fulfill the seed requirement of farmers in interior tribal pockets. It would be appropriate if the government were to include landraces and traditional varieties in Seed Village Programmes engaged in quality seed production. Government programmes can aim at location-specific technology dissemination, scientific knowledge gain and skill improvement using human and natural resources. Such an approach will go long way in aiding local crop improvement with the active involvement of tribal farm families in conserving crop genetic diversity. There is an urgent need to sustain traditional seeds by using them in varietal improvement programmes for future food availability and sustainability. Efforts should be taken by the state government to strengthen the conservation of traditional seeds for research and extension, which would require policy changes in seed regulation.

**Acknowledgement**

The present study was funded by Swiss Agency for Development and Cooperation (SDC). We thank the tribal farm families of Koraput for sharing their knowledge and time and 31 primary trainers for their effort in learning and disseminating the new knowledge. We are grateful to Prof M S Swaminathan, Prof V. Arunachalam and Dr Ajay Parida for their guidance, support and encouragement. We are thankful to Mr S V Ramana for providing necessary information on HYV seeds and State Government Policies. Dr Sheela Saravanan is acknowledged for editing the manuscript.

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**Table 3—Rates of seeds of different landraces**

<table>
<thead>
<tr>
<th>Land Category</th>
<th>Landraces</th>
<th>Purified (Rs.)</th>
<th>Un-purified (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland</td>
<td>Para, Pandakagura, Mati, Donder Basumati</td>
<td>7-8</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Medium Land</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Land</td>
<td>Bodikaburi, Sapuri, Guthia, Muktabali</td>
<td>12-15</td>
<td>10</td>
</tr>
<tr>
<td>Low Land</td>
<td>Umurichudul, Sunaseri, Veliyan, Pathangada</td>
<td>12-15</td>
<td>10</td>
</tr>
<tr>
<td>Low Land</td>
<td>*Kalajeera</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

*Promoted by the MSSRF and the Agriculture Department of Odisha

Rates as reported in the year 2008
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